

Ambl. selecting sets of the circuit devices so that a timing of a changing edge of each said sustaining pulse falls within a predetermined allowance; and providing the selected sets of the circuit devices to the plasma display apparatus.

REMARKS

In accordance with the foregoing, independent claim 1 is amended to clarify the functions of elements recited therein and further in response to the 35 USC § 112, ¶ 2 rejection of claim 1 in the Action. In addition, various other amendments are made, e.g., in claims 1, 9 and 10 to improve form and without change of substance.

No new matter is presented and, accordingly, approval and entry of the foregoing amendments are respectfully requested.

ITEMS 1-3: REJECTION OF CLAIM 1 FOR INDEFINITENESS UNDER 35 USC § 112, ¶ 2

The objected-to recitation of claim 1 is amended and thus clarified in the foregoing. It is submitted that claim 1 as now amended is in compliance with § 112, ¶ 2 and accordingly the rejection should be withdrawn.

ITEMS 4-5: REJECTION OF CLAIMS 1-10 FOR OBVIOUSNESS UNDER 35 USC § 103(a) OVER NAGAI IN VIEW OF MAKINO

The rejection is respectfully traversed.

CLAIMS 1-8

The invention as recited in claim 1 relates to phase adjusting circuits (first and second phase adjusting circuits) that adjust timing of changing edges of sustaining pulses. Particularly, the first and second phase adjusting circuits are provided to adjust timing of changing edges of respective driving signals of a first output device and a second output device. According to this feature, a power recovery circuit can work efficiently, power consumption can be reduced and malfunctions or erroneous discharge can be avoided.

However, the Examiner asserts that Makino (USP 6,160,530) "discloses a method for driving a plasma display, wherein phase edge adjusting circuits are used in order to adjust the timing of the changing edge of the sustain pulse."

It is respectfully submitted that the Examiner's understanding of Makino is incorrect. As described in the Abstract of Makino, a leading edge voltage changing rate of the sustaining pulse is adjusted. As shown in Fig. 10, a resistor and a capacitor are provided on a path

connected to the electrodes. Namely, Makino adjusts the changing rate, i.e., rate of change, of the changing edge and not the timing thereof.

According to claim 1 as now amended, an X sustaining circuit and a Y sustaining circuit, respectively supply sustaining pulses. Further, the first and second phase adjusting circuits are recited as adjusting timing of a changing edge of a driving signal which "drive said first output device...and said second output device" (respectively). Thus, the changing edges of the sustain pulses output by the first and second output devices of the X and Y sustaining circuits, respectively, are controlled or adjusted, albeit indirectly and independently of each other, by the first and second phase adjusting circuits.

Neither Nagai nor Makino disclose or even suggest the feature of the invention as recited in claim 1.

CLAIMS 9-10

The Examiner asserts that claims 9-10 differ from claims 1-3 only in that the preamble "a manufacturing method of a plasma display apparatus" is added and that claims 9-10 otherwise have substantially the limitations of claims 1-3. However, this is incorrect.

Claims 9-10 describe a method to realize a good quality plasma display apparatus without phase adjusting circuits. Namely, the invention recited in claims 9-10 is different from that of claims 1-8. The Examiner is referred to the description of the invention to which claims 9-10 are directed, appearing in Fig. 9 and described at page 16, line 34 to page 19, line 1 of the specification.

Neither Nagai nor Makino disclose or suggest the invention as recited in claims 9 and 10. Indeed, the Examiner's rejection is unrelated to the subject matter of claims 9-10.

NEW CLAIMS 11-16

New claims 11-16 are presented to afford a varying scope of protection.

Claim 11 is directed to a plasma display apparatus, and recites "a first phase adjusting circuit to adjust timing of a changing edge of a first driving signal which drives said first output device; and a second phase adjusting circuit to adjust timing of a changing edge of a second driving signal which drives said second output device" and should be allowable.

Claim 16 is directed to a manufacturing method, and recites "selecting sets of the circuit devices so that a timing of a changing edge of each said sustaining pulse falls within a predetermined allowance" and should also be allowable.

Claims 12-15, which depend directly or indirectly from claim 11, should be allowable for at least the same reasons as claim 11, as well as for the additional recitations therein. Entry, consideration and allowance are respectfully requested.

CONCLUSION

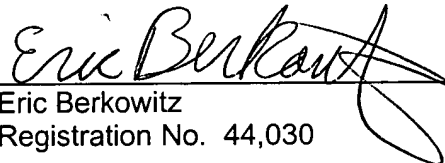
It is respectfully submitted that the pending claims patentably distinguish over the art of record and, there being no other objections or rejections, that the application is in condition for allowance, which action is earnestly solicited.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE ABSTRACT:

Please AMEND the Abstract, as follows:

A PDP apparatus of low power consumption and without erroneous malfunctions is equipped with [the] a sustaining circuit that prevents [the] an on/off timing shift and deterioration of [the] a sustaining pulse[, wherein phase] produced thereby. Phase adjusting circuits, which adjust the timing of the changing edge of the sustaining pulse, are provided [to] for the sustaining circuit; [and] the power recovery circuit is of improved [efficiently] efficiency; and [the] power consumption is reduced by optimizing the timing of [the] a changing edge of the sustaining pulse[, has been disclosed]. The circuit devices used in the sustaining circuits are classified according to delay times and sets of the circuit devices are selected so that the timing of [the] a changing edge of the sustaining pulse falls within a predetermined allowance, and the selected sets of the circuit devices are set to the PDP.

IN THE SPECIFICATION:

Please AMEND the paragraph beginning at page 1, line 27, as follows:

FIG. 1 is a block diagram showing a total structure of a general PDP apparatus. In a PDP 10, n X electrodes 11 and Y electrodes 12 are arranged [adjacently by turns] in adjacent and alternating parallel relationships, forming n pairs, each pair of an X electrode 11 and a Y electrode 12, and light is emitted for display between the X electrode 11 and Y electrode 12 of each pair. Y electrodes and X electrodes are called display electrodes and are also called sustaining electrodes. Address electrodes 13 are provided in the direction that runs at a right angle to the direction in which the display electrodes extend, and display cells are formed at crossings of the address electrodes and pairs of X electrode 11 and Y electrode 12.

Please AMEND the paragraph beginning at page 10, line 2, as follows:

To realize the above-mentioned objective, the PDP apparatus of the present invention is provided with [an] a sustaining circuit having phase adjusting circuits that adjust the timing of the changing edge of the sustaining pulse. By adjusting the phase adjusting circuits and optimizing the state of the timing of the changing edge of the sustaining pulse, the power recovery circuit can work efficiently and the power consumption will be reduced. In addition,

since the on/off timing of the sustaining pulses applied from each sustaining circuit are optimized to each other, malfunctions or erroneous discharge can be avoided.

Please AMEND the paragraph beginning at page 10, line 14, as follows:

It is particularly effective if the present invention is employed in a PDP apparatus equipped with [the] a sustaining circuit having a power recovery circuit, or one employing an ALIS system.

IN THE CLAIMS:

Please AMEND the following claims:

1. (ONCE AMENDED) A plasma display apparatus, comprising:
a plasma display panel equipped with [the] first electrodes and [the] second electrodes arranged adjacently to each other, extending in a first direction [adjacently by turns], and [the] address electrodes extending in [the] a second direction [that runs] at a right angle to the first direction [the said first and second electrodes extend,];
an X sustaining circuit that supplies sustaining pulses to [the] said first electrodes[,];
[and]
a Y sustaining circuit that supplies sustaining pulses to [the] said second electrodes[,];
wherein, the
said X sustaining circuit and the said Y sustaining circuit are equipped with phase adjusting circuits that adjust the timing of the changing edge of the said sustaining pulse]
wherein said X and Y sustaining circuits respectively comprise:
a first output device provided between a path connected to said first or second electrodes and a high potential power supply;
a second output device provided between the path connected to said first or second electrodes and a low potential power supply;
a first phase adjusting circuit that adjusts timing of a changing edge of a driving signal which drives said first output device; and
a second phase adjusting circuit that adjusts timing of a changing edge of a driving signal which drives said second output device.

2. (ONCE AMENDED) [A] The plasma display apparatus, as set forth in claim 1, wherein the [said] X sustaining circuit and the [said] Y sustaining circuit include power recovery circuits each of which has a resonant circuit formed with a display capacitor of the [said] plasma display panel, recovers energy when [the] a application of the [said] sustaining pulse is released and uses the recovered energy for [the] a next application of the [said] sustaining pulses, is provided.

3. (ONCE AMENDED) [A] The plasma display apparatus, as set forth in claim 2, wherein the [said] X sustaining circuit and the [said] Y sustaining circuit comprise the first and the second output devices connected between a path through which the [said] sustaining pulses are supplied and a high voltage power source line, and between the path and a low voltage power source line, respectively, [the] a third output device that switches [the] a connection state of the [said] path and the [said] power recovery circuit to [the] a state in which power is supplied from the [said] power recovery circuit to the [said] path, [the] a fourth output device that switches the connection state of the [said] path and the said power recovery circuit to [the] a state in which power is recovered from the [said] path to the [said] power recovery circuit, and [the] a first drive circuit through [the] a fourth drive circuit[s] that drive the [said] first through the fourth output devices, respectively; and [the said] a phase adjusting circuit [can] to adjust [the] a time difference between a turning on of the [said] third output device and that of the [said] first output device, and [the] a time difference between [the] a turning on of the [said] fourth output device and that of the [said] second output device.

4. (ONCE AMENDED) The [A] plasma display apparatus, as set forth in claim 3, wherein the [said] phase adjusting circuit comprises the first phase adjusting circuit, the second phase adjusting circuit, a third phase adjusting circuit and a [through the] fourth phase adjusting circuit[s] provided at [each former] a stage preceding [of] the [said] first drive circuit through the fourth drive circuit[s], respectively.

5. (ONCE AMENDED) The [A] plasma display apparatus, as set forth in claim 1, wherein the [said] plasma display panel forms [the] a first display line between one side of one of the [said] second electrodes and [the] one adjacent electrode of the [said] first electrodes, [the] a second display line between [the other] another side of the [said] one second electrode and [the] another adjacent electrode of the [said] first electrodes, and forms a display field of a

frame by plural subfields, and provides a gray scale by combining said subfields selectively for display; the [said] X sustaining circuit is equipped with a first X sustaining circuit that supplies the [said] sustaining pulse to an odd-numbered electrode of the [said] first electrodes, and a second X sustaining circuit that supplies the [said] sustaining pulse to an even-numbered electrode of the [said] first electrodes; and the [said] Y sustaining circuit is equipped with a first Y sustaining circuit that supplies the [said] sustaining pulse to an odd-numbered electrode of the [said] second electrodes, and a second Y sustaining circuit that supplies the [said] sustaining pulse to an even-numbered electrode of the [said] second electrodes.

6. (ONCE AMENDED) The [A] plasma display apparatus, as set forth in claim 5, wherein the [said] first X sustaining circuit and the second X sustaining circuit[s] and the [said] first Y sustaining circuit and the second Y sustaining circuit[s] are equipped with [the said] phase adjusting circuits, respectively; and [the] a difference in rising or falling timing between the sustaining pulse output by the [said] first X sustaining circuit and that output by the [said] first or the second Y sustaining circuit, and [the] a difference in rising or falling timing between the sustaining pulse output by the [said] second X sustaining circuit and that output by the [said] first or the second Y sustaining circuit are adjusted so that the differences of the timings are within a predetermined range.

7. (ONCE AMENDED) The [A] plasma display apparatus, as set forth in claim 6, wherein the [said] predetermined range is within ± 30 ns.

8. (ONCE AMENDED) The [A] plasma display apparatus, as set forth in claim 1, wherein [the said] a phase adjusting circuit is set by observing [the] a waveform when the [said] sustaining pulse is applied to the [said] first or second electrode of the [said] plasma display panel.

9. (ONCE AMENDED) A manufacturing method of a plasma display apparatus comprising a plasma display panel having first electrodes and second electrodes arranged adjacently [by turns and address electrodes] to each other, extending in [the] a first direction, and address electrodes extending in a second direction [that runs] at a right angle to the first direction [the said first and second electrodes extend], an X sustaining circuit that supplies a sustaining pulse to [the] said first electrodes, and a Y sustaining circuit that supplies a

sustaining pulse to [the] said second electrodes, wherein delay times of circuit devices with respect to signals, which form the [said] X sustaining circuit and the [said] Y sustaining circuit, are measured and the circuit devices are classified according to the delay times; sets of the classified circuit devices are selected so that [the] a timing of [the] a changing edge of [the] each said sustaining pulse falls within a predetermined allowance; and the sets of the selected circuit devices are [set to] provided for the plasma display apparatus.

10. (ONCE AMENDED) A manufacturing method of a plasma display apparatus, as set forth in claim 9, wherein [the] said plasma display panel forms a first display line between one side of one of the [said] second electrodes and [the] one adjacent electrode of the [said] first electrodes, a second display line between [the other] another side of the [said] one second electrode and [the] another adjacent electrode of the [said] first electrodes, forms a display field of a frame by plural subfields, and provides [the] a gray scale by combining said subfields selectively for display; the [said] X sustaining circuit is equipped with a first X sustaining circuit that supplies the [said] sustaining pulse to an odd-numbered electrode of the [said] first electrodes, and a second X sustaining circuit that supplies the [said] sustaining pulse to an even-numbered electrode of the [said] first electrodes; the [said] Y sustaining circuit is equipped with a first Y sustaining circuit that supplies the [said] sustaining pulse to an odd-numbered electrode of the [said] second electrodes, and a second Y sustaining circuit that supplies the [said] sustaining pulse to an even-numbered electrode of the [said] second electrodes; and [the] a difference in rising or falling timing between the sustaining pulse output by the [said] first X sustaining circuit and that output by the [said] first or the second Y sustaining circuit, and [the] a difference in rising or falling timing between the sustaining pulse output by the [said] second X sustaining circuit and that output by the [said] first or the second Y sustaining circuit are adjusted so that the differences of timings are within a predetermined range, when the circuit devices of the [said] first and second X sustaining circuits and the [said] first and second Y sustaining circuits are selected.

11. (NEW) A plasma display apparatus having a plasma display panel with first electrodes and second electrodes arranged adjacently to each other, extending in a first direction, and address electrodes extending in a second direction at a right angle to the first direction, comprising:

X and Y sustaining circuits to supply sustaining pulses to said first electrodes and said second electrodes, respectively;

wherein said X and Y sustaining circuits respectively comprise:

a first output device;

a second output device, the first and second output devices of respective X and Y sustain circuits generating sustaining pulses;

a first phase adjusting circuit to adjust timing of a changing edge of a first driving signal which drives said first output device; and

a second phase adjusting circuit to adjust timing of a changing edge of a second driving signal which drives said second output device.

12. (NEW) The plasma display apparatus, as set forth in claim 11, wherein the X sustaining circuit and the Y sustaining circuit, respectively, further comprising:

a power recovery circuit having a resonant circuit formed with a display capacitor of the plasma display panel to recover energy of an applied sustaining pulse for an application in a subsequent sustaining pulse.

13. (NEW) The plasma display apparatus, as set forth in claim 12, wherein the X sustaining circuit and the Y sustaining circuit, respectively, further comprise:

one of a first connection between a high voltage power source line and the first and the second output devices and a second connection between a low voltage power source line and the first and the second output devices to supply and recover energy from the sustaining pulses.

14. (NEW) The plasma display apparatus, as set forth in claim 13, wherein the X sustaining circuit and the Y sustaining circuit, respectively, further comprise:

a first drive circuit through a fourth drive circuit that drive the first output device through the fourth output device, respectively; and a phase adjusting circuit to adjust a time difference between a beginning of an on-state of the third output device and a beginning of an on-state of the first output device, and a time difference between a beginning of an on-state of the fourth output device and a beginning of an on-state of the second output device.

15. (NEW) The plasma display apparatus, as set forth in claim 14, wherein the phase adjusting circuit comprises the first phase adjusting circuit, the second phase adjusting circuit, a third phase adjusting circuit and a fourth phase adjusting circuit provided at a stage preceding the first drive circuit through the fourth drive circuit, respectively.

16. (NEW) A method of manufacturing a plasma display apparatus having X and Y sustaining circuits to supply sustaining pulses to first electrodes and second electrodes, respectively, comprising:

measuring delay times of circuit devices which form the X sustaining circuit and Y sustaining circuit with respect to signals;

selecting sets of the circuit devices so that a timing of a changing edge of [the] each said sustaining pulse falls within a predetermined allowance; and

providing the selected sets of the circuit devices to the plasma display apparatus.